STRATEGY RESEARCH PROJECT

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TRANSFORMING THE U.S. NAVY INTO A WEB-ENABLED ORGANIZATION

BY

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ABSTRACT

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TITLE: Transforming the U.S. Navy into a Web Enabled Organization

FORMAT: Strategy Research Project

DATE: 09 April 2002 PAGES: 32 CLASSIFICATION: Unclassified

The Navy must take full advantage of web-based technology to continue to transform into a 21st century fighting force. This will require the Navy to leverage information and web-based technologies from commercial industry to meet future threats and mission requirements. Web-based technology can enhance fleet readiness and improve the quality of life for our sailors and marines. Transforming the U.S. Navy to a web-enabled environment will increase interoperability among business units, standardize interfaces, and minimize redundant resources of data.

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PREFACE

This paper will describe how the WEB-Enabled Navy (WEN) will utilize the capabilities of the Navy & Marine Corps Intranet (NMCI) and the Navy Maritime Tactical Information Technology (IT-21) warfare operation processes both ashore and afloat. The U.S. Navy is transforming itself into an Internet-enabled fighting force based on close observation of current business practices and utilizing the World Wide Web. Recent rapid advances in information technology offer the potential to dramatically streamline the flow of information and decision processes within the Navy.

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TRANSFORMING THE U.S. NAVY INTO A WEB-ENABLE ORGANIZATION

The U.S. Navy must become more web-enabled in order to become an effective fighting force in the 21st Century. The Navy must also exploit the rapid advances in information technology by commercial industry to achieve information superiority in net-centric warfare. Emerging web-based technology and innovative operational concepts can create new opportunities for employing naval forces in support of the U.S. national military strategy and joint military operations. This study will show how Navy war-fighters and supporting organizations can use web-based technologies to improve business processes and gain global access to required authoritative information for mission accomplishment. In addition, this study describes a process to accelerate the integration of information exchange across the entire Navy through the use of web-based technology.

THE TRANSFORMATION PROCESS

Commercial industries are leading the way in adopting information-age concepts and technologies for business applications. In addition, they are using Information Technology (IT) to adapt to a changing global business environment. These organizations are driven by a need to be innovative, to keep abreast of competition, and to gain entry into the global market. The new reality of the global world and advances in IT are forcing public and non-profit organizations to reinvent, restructure, and reengineer themselves with many new IT strategies borrowed from the commercial sector.[1] The U.S. Navy must as well exploit the rapid advances in IT and web-based technologies developed by commercial industry. The Chief of Naval Operation (CNO) and the Vice-Chief of Naval Operations (VCNO) are convinced that now is the time for the U.S. Navy to exploit the advances in web-based technologies. The Navy should accelerate its efforts to create an integrated transformation of information exchange.[2]

Retired Admiral Jay L. Johnson, former CNO recently promulgated a Naval doctrine called " Forward ...From the Sea" (1992), which established the Navy's strategic vision for 2010 and beyond. This doctrine calls for a shift from blue-water to littoral operations. "Forward...From the Sea" recognizes the unique contribution of the Navy and Marine Corps force structure in support of the National Military Strategy. It addresses the contributions of our naval forces to the national security strategy in strategic deterrence, control of the seas, and maritime supremacy, and strategic sealift. This document also advocates the on-going process of innovation that is rapidly transforming the Navy into a 21st Century fighting force. The Navy

must continue to integrate web-based technology into its organizations to remain a vital force on the cutting edge of our nation's defense. [3]

The U.S. Navy is currently undergoing a business transformation process as part of the Revolution in Military Affairs (RMA). The RMA encourages the use of IT and web-based technologies for the development of business applications and systems within the Department of Defense (DoD). The applications of Internet and web technology in the commercial sector have provided improved data storage, data handling and data access, which facilitate the accuracy and timeliness of information exchange and decision-making.[4]

THE WEB ENABLED NAVY (WEN)

Admiral W. J. Fallon, VCNO, has formulated a strategy for the Navy to take advantage of web technology both ashore and afloat. He believe that our sailors welfare, current and future readiness, and quality of service are can be enhanced through the use of web-based technology. Admiral Fallon's strategic vision for a 21st Century Navy is the WEN, which will enable the Navy to operate more efficiently from desktop computers. The WEN is designed to provide global access to required authoritative information independent of application and data location via an Internet browser mechanism.[5]

WEN will transform the Navy to a web-based business organization. The goal is to better enable Navy personnel to perform their mission by providing enterprise-wide access to knowledge-based systems and IT tools through web-enablement. Web-enablement integrates interoperable web technologies across the naval infrastructure so that subscribers and publishers (users and providers) of information can pull or push information "services" as required to perform operational or business transactions.[6] WEN comprehensively satisfies the needs for the business and operational consumers of information, provides a mechanism for interoperability with joint and coalition forces, as well as means of conducting business with external agencies. The services provided by web-enablement include real-time voice contact (wireless), video teleconferencing, pager services, wireless connectivity, radio net services for cellular phone users, and tactical network interface.

OBJECTIVE FOR A WEB BASED NAVY

Admiral Fallon envisions the WEN supporting "a Navy in which operational and business processes are conducted worldwide via interconnected and interoperable web-base IT systems." [7] He has directed Task Force Web (TFW) to transform the Navy into a web- based organization. TFW will issue guidance concerning existing and new IT applications. The goal is

to develop an approved approach and implementation plan exploiting existing and future technologies to achieve a web-enabled Navy. TFW will focus first on web-enabling applications at the ship level and work back into the shore infrastructure.[8] TFW will direct specific actions and provide a general timeline to web-enabled the Navy.[9] Its goal is to better enhance the Navy's capability to perform combat mission support for both deployable and non-deployable units in a fully mobile joint environment.

Commercial industry is experiencing a revolution in electronic commerce. Web technologies are providing mechanisms that better link parts to product developers and product retailers, facilitating distribution of the product to the consumer. In addition, web technology provides the means for companies to make real-time or near real-time updates to product development databases. This capability provides corporations with the ability to rapidly tailor short and long-term strategies and overall business processes to meet changes in the market environment.

The Navy is also experiencing a revolution in electronic commerce operations. This will help the Navy to leverage the changes that are revolutionizing the way commercial companies do business by means of electronic commerce as a result of web technology. The Navy must utilize commercial products in its current efforts to introduce web-enabled services to its operational and business processes. TFW has developed an operational view of the WEN architecture that allows requirement and resource sponsors, product developers, and vendors to have a common view of Navy's world-class web-enabled system.[10]

BENEFITS OF THE WEN

WEN will improve the mission effectiveness and productivity of sailors and marines.[11] Web-based technologies will provide warfighters and supporting organizations with global access to all required information, systems and processes needed to complete their missions. In addition, WEN will enable fleet commanders to make better and quicker tactical decisions through a single data entry source. This means that WEN will provide fleet commanders with global access to data through a common Internet web browser. WEN will provide the fleet and shore activities with a common set of web-service components for Navy- wide information operation. These include intelligent information search capability, collaboration tools, common database applications, on-line training, and access to voice, data, and video capabilities. The web-enabling effort will improve mission effectiveness and productivity through better interoperability, data commonality, and reduction of redundant systems.[12]

Former Secretary of Navy Richard Danzig asserted that the Internet opens up lots of possibilities for the Sailors and Marines in the fleet. He claimed that the Quality of Life virtual shopping mall improves sailors' morale.[13] This Internet portal site gives service members and their families direct Internet access to information on housing, deployments, educational opportunities, and other benefits. Additionally, distance education and telemedicine open opportunities for use in shipboard training and improving the quality of life onboard ship.[14] E-mail on ships is probably the most important morale booster in recent years.

WEN will leverage the benefits of Wide Area Networks such as the Internet to facilitate communication and business dealing with a broad range of business partners. In a well-connected enterprise, government employees, customers, suppliers, and other business partners may utilized numerous WEN applications to obtain critical business information. WEN will provide users with Single Sign-On (SSO) capabilities. SSO enable users to access multiple web-enable resources using a single password. Also, SSO capabilities offer improved security through the system administrator's enhanced ability to maintain the integrity of user-access configurations.[15] Coordination of web-enabling efforts is critical to achieving maximum benefits from our investment in technology.

CHALLENGES AFFECTING TRANSFORMATION: EIGHT MAJOR PROBLEMS

The current information processes pose eight significant problems.

1. First, the current system is inefficient and impedes the information-sharing among the various Navy activities.
2. Second, there is inadequate security for some of the Navy's current networks.
3. Third, many Navy systems and organizations are still characterized by "stove pipe" information systems. That is, some Navy units have applied information technology to limit their mission activities to a localized point of view. Systems developed in this manner tend to be inaccessible to other elements of the organization, so they do not communicate or exchange information well with other systems. Furthermore, some units may not have applied automation, so they are still managing paper information resources.[16]
4. Fourth, legacy systems have limited interoperability. Legacy transition processing systems typically do not share data or interoperate well with other systems unless specific functionality is designed into the systems to exchange data. When this is done, the interface is frequently accomplished in a highly

structured batch data stream. Web-enabling legacy applications may not be easy to accomplish.[17]

5. Fifth, some legacy systems have that the same or similar data elements are frequently maintained in several different legacy systems. The data in one system may be updated by a transaction that is not provided by the other system. The question then arises of which source is the authoritative source.[18]
6. Sixth, the current Navy information infrastructure poses several challenges that must be addressed during the web-enablement process. Legacy transaction processing systems that support specific functional areas such as personnel, finance, and logistics were not originally designed to work on the web. The Navy currently employed over 5000 legacy applications. There is not enough funding in the IT budget to web-enable all of these legacy applications. The Navy's strategic leaders must prioritize which legacy applications should be web-enabled.[19]
7. Seventh, information in document form is managed locally on local area network servers. These documents are in various file formats; information in the documents is not organized in standardized formats, the documents and information are not indexed for retrieval, and access to the networks is controlled. Access to this information by potential users from other functional areas is difficult, if not impossible.[20]
8. Eighth, that there is no enterprise-wide plan for Navy-wide web-enablement that would ensure interoperability with the computer systems of the Army, Air Force, Marine Corps, or Coalition Forces. [21]

CHALLENGES AFFECTING TRANSFORMATION

Several challenges that must be addressed in order to provide full Navy-wide web-enablement. These challenges are not show stoppers and can be overcome with the phased implementation of TFW. Navy ships are still bandwidth challenged compared to shore units.[22] Many applications use a Transmission Control Protocol that requires the receiving computer to send acknowledgements. This service cannot be sustained when ships are limited to only low data connectivity due to ship operations on the communication links. Major updates to non-time critical databases via other media may be necessary until bandwidth deficiencies are resolved.[23] All elements of DoD and many of the coalition forces are developing their own web-enabled systems. Immediate coordination is required to ensure future Interoperability among

these systems. Before these independent efforts progress too far, DoD should establish a Joint Integrated Product team (IPT) to ensure that interoperability standards are established and maintained.[24]

Unlike the other services, the Navy does not have a Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) officers or a parallel enlisted career path. To implement Navy-wide web-enablement, we need military personnel with background in C4ISR to manage the WEN. Currently, Navy organizations provide such personnel from unmatched skill sets.

CHANGE MANAGEMENT

No organization today, large or small is immune to change. Change is essential in order for organizations, both public and private, to survive in an environment driven on by modern technology, limited resources, and global competition. According to Peter Drucker, One cannot manage change but must strive to be ahead of it. The organizational scholar believes that most people have accepted that change is unavoidable. We can safely assume then that subordinates have, for the most part resigned themselves to the reality of change. However, the focus of leading and managing change may be shifting. This means that subordinates are now accepting change as the norm in most organizations. Even so, subordinates need to know why the change is important and how it impacts the strategic goal of the organization.[25] That is, organizations need high-level people to lead the change.

Strategic leaders within the Navy must focus on altering subordinates' preferences for no change and mitigate behaviors that seek to postpone change. Subordinates need to know what the change is, what specific benefits are expected by change, and how they should deal with conflicting priorities in an environment where multiple changes are taking place. They need the tools to assimilate change. Rewards and other motivators should continually encourage necessary and beneficial change.[26]

Change management must focus first on change leadership. Change leadership begins when influence individuals view change as an opportunity instead of as an obstacle. Then they seek to find the right changes and facilitate those changes effectively. Producing effective change is about 80 percent leadership, because it involves establishing direction, then aligning, motivating, and inspiring people. The remaining 20 percent of producing change requires planning, budgeting, organizing, and problem solving.[27] To cope with new technology, competition, and demographic forces, leaders in every sector have sought to alter fundamentally the way their organization does business.

The VCNO as a strategic leader is leading the efforts to transform the Navy to a web based organization. He has developed a change vision and implementation strategy to implement the IT requirements for the Navy in the 21st century. A change vision offers a picture of the future. The Navy's change vision focuses on the WEN with implementation by TFW. A change vision incorporates hundreds or thousands of more detailed decisions, motivates people to take action in the right direction and helps coordinate the actions of various players. The VCNO has developed a Change Management Plan (CMP) to transform the Navy to a web based organization. This CMP will help Navy personnel deal with the change and the uncertainty of an increasingly technical environment. The CMP designates the change leadership practices for each of the WEN changes. John P. Kotter identifies eight steps that a strategic leader must take in order to successfully transform an organization.[28] The VCNO's CMP incorporates these eight steps; (1) establish a sense of urgency, (2) create a guiding coalition, (3) create a vision, (4) communicate the vision, (5) empower others to act on the vision, (6) generate short-term wins, (7) consolidate improvements and (8) institutionalize new approaches.

BARRIERS TO CHANGE

The biggest barrier to effecting change in an organization is the culture of the people.[29] The most difficult task ahead for the VCNO and other strategic leaders is to change the culture, the institutional and information- sharing processes within the Navy's IT community. In many transformation efforts, the old culture resists the new vision. When new practices are grafted on to an old culture, they can be very fragile and subject to regression. In a large military bureaucracy such as the U.S. Navy, many subordinate organizations have their own subcultures. For example, the culture of the Navy surface, subsurface, and aviation communities all have the same values, but they may all have different norms. The first step in any transformation is to alter the norms and values of the people. In my opinion, Admiral Fallon is the best leader to establish the urgency for change because he understands the culture of the Navy's warfighters.

A major challenge for the VCNO is to build coalitions within all subcultures so that they buy into the WEN vision. The biggest mistake people make when trying to change organizations is to plunge ahead without establishing a sufficient sense of urgency among other leaders and subordinates. This is fatal because transformations always fail to achieve their objectives when most personnel remain complacent.[30] The Navy's strategic leaders must establish a sense of urgency for the WEN. Establishing a sense of urgency is critical to gaining

cooperation needed for implementing a change. Kotter suggests that the single best way to foster urgency is to create a crisis.[31] The single biggest obstacle to implementing change is overcoming complacency. The VCNO has established the urgency for all new and some legacy Navy's IT applications and systems to be web-enabled in the near future.

NEW STRATEGIES FOR BUSINESS TRANSFORMATON

CLINGER-COHEN ACT

In 1996 Congress enacted the Information Technology Management Reform Act and the Federal Acquisition Reform Act. These two Acts together, known as the Clinger-Cohen Act, require the heads of Federal agencies to link IT investments to agency accomplishments. The Clinger-Cohen Act also requires that agency heads establish a process to select, manage and control their IT investment.[32] Congress and President Clinton had long recognized the importance of IT for effective management of government and non-profit organizations.

The Clinger-Cohen Act provides a number of significant opportunities for DoD to further streamline and reduce non-value added steps in the IT acquisition process. Among the most significant changes authorized by the Act is the use of simplified acquisition procedures for commercial IT items between the acquisition threshold of $100,000 and $5 Million.[33] This change eliminated government-unique requirements previously cited by industry as a barrier to doing business with DoD. The Act also provides authority for DoD to implement electronic commerce and electronic data interchange. The Clinger-Cohen Act also provides substantial relief from the cumbersome processes that add little value, but significant cost, to the acquisition of IT systems.

The passage of the Clinger-Cohen Act allows DoD to focus on the appropriate use and management of IT resources. The Clinger-Cohen Act provides the authority for the Navy to acquire and test the web-enabling tools and IT technology most suitable for the WEN. The Clinger-Cohen Act established the requirement for federal agencies to appoint Chief Information Officers for "developing, maintaining and facilitating the implementation of a integrated IT Architecture" (ITA). ITA is an integrated framework for evolving and maintaining existing IT systems and acquiring new IT applications to achieve an agency's strategic goals. It aligned IT with the business processes and mission of each agency.[34]

ELECTRONIC COMMERCE

The Navy has adopted many "best business practices" used by the world's most successful companies. One business practice adopted by the Navy is the use of

electronic commerce, which is one of the five key elements in the President's Management and Performance Plan. The President's Budget outlined how we will focus on our E-Government initiatives. We can improve the performance and reduce the administrative costs through the use of e-business practices in areas such as supply chain management, financial management, and knowledge management.

WEN will enable our fleet customers and business managers to conduct business in the electronic market environment through the use of e-business. This will allow the Navy to carry out business transformation through the use of emerging web-based technology. The goal is to enable customers and business managers to conduct business in the electronic market environment. For example, on May 5, 2001 the U.S. Navy conducted the first reverse online auction to purchase electronic components through the use of FreeMarkets.com. This was the first ever on-line auction on behalf of the federal government.[35] Electronic commerce will save the Department of the Navy (DON) money and streamline its business operations using the Internet.

THE PATH TO WEB ENABLEMENT

The Navy has selected two principal web-enabling transformation tools. They are NMCI and IT-21. These two processes will provide the opportunity to transform to a fully web-based Navy in the very near future. NMCI and IT-21 provide tremendous opportunity to convert existing legacy IT applications to workable web portal applications. The path to web-enablement will start with the full operation of the NMCI, which is scheduled to occur in 2003.

THE TRANSFORMATION PROCESS

Navy IT systems are being significantly enhanced with the introduction of NMCI and IT-21 infrastructure backbone and network installations. WEN will utilize the capabilities of NMCI and IT-21 networks in order to facilitate business and warfare operations both ashore and afloat. In addition, several other web-enabling tools will be use during the transformation process, such as Navy Electronic On-line (NECO), One Touch Supply, Distance Support, and Net Centric Warfare.[36] All operational requirements documents for current and future IT acquisitions must be reviewed to ensure compliance with the Navy's comprehensive web-enabling effort. TFW will be challenged to maintain an evolving overarching Navy web-enabling blueprint. This will require that TFW work with Systems Commands and Program Executive Offices to prioritize and migrate existing and future IT systems into the blueprint.

The Navy must use web-based applications that facilitate a single Navy-wide access point to all business and warfare operation transactions. These transactions will be performed through a Navy Enterprise Portal (NEP). Users will be able to access any applications integrated into the portal and use such application to act upon any data source providing that it meets the processing requirements of the application. The NEP will provide information and web services to users through a standardized web-based interface. Push technology will be used to disseminate time sensitive information to users based on previously stored files, then it will distribute information across Wide Area Network data links.

NAVY/ MARINE CORPS INTRANET

Navy transformation to a web-enabled environment will rely considerably on NMCI. This intranet will establish a common end-to-end information service for voice, video, and data communication for all civilian and military personnel within the DON, including deployed forces. In addition, NMCI will be the single source for IT support across the DON for desktop computers, networks, helpdesks, maintenance and technology upgrade. IT will be purchased from the commercial sector just as the Navy buys other types of utilities (such as water, telephone, gas, and electricity), paying for services as they are delivered. NMCI will enable the Navy to achieve a common IT baseline across the DON both ashore and afloat.[37] All IT applications including some legacy systems, must transfer to NMCI in the near future. NMCI will allow the Navy to focus its limited resources on naval missions, not IT support.

The DON will rely on NMCI to support mission requirements. NMCI will support faster, better, more secure decision-making by providing a seamless flow of information across the DON. It will replace numerous independent networks ashore with one secure network. NMCI will interface with the afloat information infrastructure (IT-21) and be an integral part of the Global Information Grid. NMCI give the Navy a means to leverage new technologies and industrial innovations to better achieve the global Naval mission. This investment in the future will strengthen the modern Navy infrastructure by providing knowledge management systems worldwide, which will enhance the quality of life for every sailor, marines, and DON civilians.[38] In addition, NMCI will provide external connections to DON's business partners.

NMCI will allow the Navy and Marine Corps to achieve the same kinds of efficiencies that the Internet provides for private business, such as purchasing and personnel functions. The system will put huge resources at the fingertips of sailors and marines in the field.[39] For example, where shipboard mechanics now may have to wait until reaching shore to repair certain equipment due to lack of technical documentation, but NMCI would let them call up

plans and manuals on the spot. Former Secretary of the Navy Richard Danzig believes that with NMCI we can change the culture of the organization and create a united DON that will be better able to carry out its missions throughout the world."[40]

IT-21 INFORMATION TECHNOLOGY FOR THE 21ST CENTURY

The military industrial complex is embracing the online world in a move that will restructure the way the United States military operates.[41] Most U. S. military forces are non-combat support units, so the military establishment is a logical candidate for online technology for buying and processing goods and material. Military establishments are now only beginning to use online procurement and supply-chain management systems. Another key concept that will transform the U.S. Navy to a web-enabled environment is IT-21, a fleet-driven Command, Control, Communications, Computers and Intelligence (C4I) program designed to provide operating forces and the operational support infrastructure with a seamless command, control, communication structure from headquarters to command ships, from battle group commanders to warships, and from desktop to desktop.

IT-21 enables warfighters to exchange classified and unclassified, tactical and non-tactical information from a single desktop computer. The operational process function of the Navy's web is being built on the IT-21 architecture. IT-21 is already installed on certain Carrier Battle Groups and Amphibious Ready Groups (ARG), enabling ships that deploy together to have the same generation of technology. IT-21 serves as a force multiplier by providing situational awareness, which give commanders a common operational picture, enhanced speed and agility of command, and improved information support.[42]

IT-21 represents a dramatic step forward for our naval forces along the path of web-enablement. IT-21 facilitates collaborative planning among distance commanders and their subordinates, as well as sharing a common operational picture for our deployed warfighters. This is an important step in building the "Information Grid" required to conduct Network Centric Warfare (NCW). IT-21 will help ensure that Naval forces achieve and maintain information superiority in the battle space.

NAVY ELECTRONIC ON-LINE

NECO is a paperless electronic commerce system. It is an interactive procurement website, created and maintained by the Navy Supply Systems Command (NAVSUP). NECO allows the Navy's inventory managers to purchase supplies over the web for the fleet. The system is unique, since it is truly electronic from the release of the solicitation from the

buyers' desk through the contract award. The majority of the Navy Inventory Control Point's (NAVICP) contracting actions are processed through NECO. [43]

The Navy has entered into a federal buying exchange program for electronic procurement. Buying exchanges use the Internet to connect multiple buyers with multiple, pre-qualified sellers.[44] The Naval Sea Systems Command (NAVSEA), the largest of the Navy's five systems commands, will use a vendor's buying exchange service to purchase professional support services. Commerce One, Inc. will host the buying exchange for NAVSEA under a five-year contract. This is the first known federal buying exchange.[45] Commerce One, Inc. will create a database of professional support services that are available through the buying exchange service. Such a database will help streamline NAVSEA purchase and eliminate redundancies. NAVSEA will save money and time in the procurement process by making the process more simple and direct. [46]

ONE-TOUCH SUPPLY

One-Touch Supply is a web-based system that provides fleet customers with the ability to access the supply system via the Internet. It will be the Navy's single point of entry for supply inquires. The system offers an abundance of information and a variety of sources to enhance the functionality of the supply system. This portal enables customers to identify the location of stock requisitions, perform technical screening and check on the status of requisitions.

NAVSUP's corporate vision for One Touch Supply is " a single action by the customers which activates a global network of sources that delivers best value products and services." [47] The goal is to provide the fleet customers with a single "One-Touch" website for all supply related processes. The web-enablement of One-Touch Supply system will allow for rapid delivery of functionality to those systems that did not have it. One-Touch Supply system will provide fleet customers with an additional entry point into the Navy Supply Systems. One-Touch Supply system can also access the broad range of Navy and defense logistics supply and logistics databases and web-based applications. It will allow the Navy to review a wide range of supplier offerings online and make purchases using the Government Purchase Card.

DISTANCE SUPPORT

Distance Support is the fleet's information super highway. Distance Support is the process of adopting and transitioning today's technology support infrastructure and business processes through the use of web-technology, e-business, and IT systems. It is the Navy's latest innovation to connect the fleet with service providers. Distance Support is a single "reach-

back-portal" for streamlined access to any data, information, and ashore subject matter expert support. It provides sailors at sea with a single desktop point of entry to an integrated support tool, which they can access, Naval maintenance, technical, supply, training, administrative, and personnel resources. Distance Support leverage the latest technology to provide support when at sea.

Distance Support is composed of four basic tools to communicate and assist the fleet. They include an Internet e-business connection at www.anchordesk.navy.mil, a series of "Tele-Tools" to facilitate electronic communication, a shared data environment for information exchange, and the Navy Integrated Call Center. Distance Support provides sailors with a single desktop computer point of entry for access to information about maintenance procedures, technical data, supply support training, administrative and personnel resources.[48]

Sailors can use their personal computer to chat with field engineers anywhere in the world from the ship. Distance Support provides the sailors with access to photographs of equipment, drawings, alignment procedures, test equipment readings, and just about anything that they will need to remedy a problem without waiting for a technician to travel to the ship. Distance Support can be initiated by a telephone call or by an electronic message from the ship. For example, on the USS Abraham Lincoln, "real time interaction between the shipboard technicians and the subject matter experts accomplished more in one hour than six emails over a span of a week's time." Distance Support is currently fielded on all platforms in the Lincoln Battle Group and Tarawa ARG.[49]

NETWORK-CENTRIC WARFARE

The final tool for transforming the Navy into a web-enabled fighting force is NCW, an information network that will use recent advances in communication and computing technology to connect widely dispersed and diverse forces into an effective and coordinated team. NCW is emphasized in the Joint Chiefs of Staff's "Joint Vision 2010," released in July 1996 by Chairman of the Joint Chiefs of Staff, General John M. Shalikashvili.[50] NCW will allow future operations in the battle group or joint task force to share real-time knowledge and cooperative targeting through common communication systems and architecture. Information superiority means our commanders know more about the battlefield than the enemy does. Furthermore, they can act on this knowledge much faster than the enemy can act.

Vice Admiral Robert J. Natter, Director Space Information Warfare, Command and Control assert that if we achieve information superiority, we should be able to overcome an initial disadvantage in position or material and still achieve our military objectives.[51] He believes

that "knowing more than the enemy" involves five steps: data collection, processing, display, evaluation, and dissemination. Vice Admiral Natter claims that by following these five steps, raw data gathered from sensors in the field and other sources can be transformed into useful knowledge. Our warfighters can then use this knowledge to enhance the their battle plans. He is convinced that the end results of information superiority, coupled with advanced in weapon systems, will allow us to shape the conflict to our advantage. This emerging direction of warfare, based on networked forces, relies heavily on three American strengths: communication, computers, and the Internet.

They key to NCW is to manage information and network so that any member of the net can access directly any other participant to exchange information or coordinate activity.[52] The Navy's umbrella strategy for making this happen on NCW is IT-21. It provides for the accelerated implementation of C4I innovations and existing systems and capabilities. NCW will help the Navy achieve a technological transformation of information exchange across the battle space. Navy's ship C4I systems will become more effective when they can share information in the NCW process.

Vice Admiral (retired) Arthur K. Cebrowski, former president of the Naval War College, has been one of the leading advocates for NCW.[53] He has fought for a new generation of sensors to collect information, and to acquire better computer networks that will allow ships to share information. Information sharing enhances the quality of information and shared situational awareness. NCW allows for a shared situational awareness of the battlespace, which fosters collaboration, enhances sustainability and speed of command. These, in turn, dramatically increase mission effectiveness. NCW focuses on access to gathering, processing, and managing information to take advantage of the growing power resident in information networks. NCW offers a method to build information superiority, which is the key to success in future battlespace.[54]

NEW OPPORTUNITIES FOR DEPLOYING NAVAL FORCES

ENTERPRISE WIDE IT SOLUTION

NMCI and IT-21 will provide the Navy with an enterprise-wide, end-to-end, directory serviced architecture. In effect, they will create a web-enabled Navy. Navy personnel will be able to perform their mission better with enterprise access to web based knowledge management and IT systems. As the NMCI initiative and the Information Strike Force Team continue to standardize the DON and Marine Corps infrastructure, they will provide the

necessary security features to maintain the Navy's overall information assurance. The NMCI Information Strike Force Team will interface with the DON, Marine Corps, and DoD enterprise to support the interoperability among networks.[55] The NMCI Strike Force Team will ensure that Navy enterprise sensitive, unclassified information remains protected, using a variety of security systems based on the level of assurance needed.

INTERNET ENABLING FIGHTING FORCE

The Implementation of NMCI, IT-21 and NCW will transform the U.S. Navy into an Internet enabled fighting force. NMCI connectivity, with a hardware and software baselines, will be the foundation for any IT system within the DON. NMCI will tie together all IT systems at bases and command centers into a single high-capacity network. In addition, NMCI will be linked to the rest of the Defense Department and to the nation's regional commanders in chief through the Defense Information Services Network.[56] Fleet commanders will have online access to global information, such as intelligence sharing by using the web-enablement tools. For the Marines, the new intranet will support a "seamless information continuum" that will extend from the supporting establishment to the battlefield.[57]

CONCLUSION

The path to web-enablement starts with NMCI but NMCI is not a fully funded program. The Navy needs to increase the funding level to at least five years. Otherwise the path to web-enablement will be in jeopardy. Such funding might require the Navy to terminate some acquisition programs. NMIC will be one of the largest and most expensive IT projects ever undertaken by DoD. The cost of the NMCI contract is $6.9 billion for five years. The potential cost of NMCI could be over $15 billion over the life cycle of the contract.[58] On the other hand, it is it very difficult to determine how much money the NMCI contract will save the DON over the life cycle of the program. The main issue is whether the Navy can fully develop NMCI while continuing to fund its major ship acquisition programs.

The time line to fully implement NMCI is too optimistic and should be move forward to 2006. NMCI is too massive of an IT project for the DON to fully implement in a short time. The scope and complexity of NMCI will make it hard for the DON to have it fully implemented by 2003. The Navy must accelerate the process if it expects to become a fully web-enabled business organization by 2003. This can be done by managing NMCI as an acquisition program instead of an IT program, this which will provide for more increased oversight of the program within the DON and DoD. In addition, the DON will have to provide additional

resources to NMCI if it expects to have it fully implemented by 2003. NMIC should start as a pilot program. As it shows promise and potential, it should be fully implemented.

A major challenge for NMCI is current bandwidth limitations and the problems with routing information to support web-enabled applications. NMCI must provide "plug-and-play interoperability" in all environments, including joint and coalition operations. It must be flexible enough to handle conditions ranging from peacetime operations to major theater war. There is no requirement in the contract for the NMCI's service provider to meet certain bandwidth standards. This lack of bandwidth standards could become an impediment to the creation and sharing of knowledge worldwide.

Improved security is another key requirement of NMCI. It must allow the DON's personnel to share information worldwide with those who need it. Protecting crucial information could be a major challenge, because the program envisions that one network will carry everything from the personal e-mail message of service members to highly classified intelligence data, combat orders, and wartime decision-making video conferences among senior officials. The DON is allowing the service provider to make decisions on security requirements instead of the government. We should be concerned that the government might lose control over security requirements for NMCI.

The NMCI contract is a fixed price contract. The service provider picks the technologies that will provide the service at the lowest possible cost because that allows him to make the most profits. Under these terms, DON might not get new commercial technology as they enter the market because the service provider would be more concerned about profits than quality of service. There is no line item in the NMCI contract for the service provider to conduct Research and Development (R&D). We should be concerned that the users will not get increased IT functionally or capability in rapid fashion without an R&D line in the contract. The NMCI contract should be performance base to allow for rapid integration of new technologies and R&D programs.

Coordination of web-enabling efforts across the DON is an important step toward achieving the maximum benefits from our investment in NMCI and IT systems. NMCI will break down some of the barriers that keep people from getting the information when they need it. The VCNO has developed the vision for the WEN. It is now up to the strategic leaders to keep the Navy on the right path to web-enablement. The Navy can achieve substantial productivity and user satisfaction gains from immediate and rapid deployment of web technology. Success in the WEN transformation will require support by senior leadership, which must convey as of urgency for this change to all military and civilian DON personnel.

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